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AF/2853/18

Patent
Attorney's Docket No. 009683-329

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#17/Appeal Brief Attached 3/3/03

In re Patent Application of	)	
	)	
Eiichi SANO et al.	)	Group Art Unit: 2853
	)	
Application No.: 09/057,502	)	Examiner: C. Hallacher
	)	
Filed: April 9, 1998	)	Appeal No. 6476
	)	
For: INK JET PRINTER CAPABLE OF FORMING HIGH DEFINITION IMAGES	)	

BRIEF FOR APPELLANT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

This appeal is from the decision of the Primary Examiner dated August 6, 2002, finally rejecting claims 1-3, 5-11, 13-18, and 20-33, which are reproduced as an Appendix to this brief.

A check covering the $320.00 (1402) Government fee and two extra copies of this brief are being filed herewith.

The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§1.16, 1.17, and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800. This paper is submitted in triplicate.

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I. Real Party in Interest

The Real Part in Interest is the assignee of the application, Minolta Co., Ltd.

II. Related Appeals and Interferences

There are no other appeals or interferences known to the Appellants, the Appellants' legal representative, or assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal.

III. Status of Claims

Claims 1-3, 5-11, 13-18, and 20-33 are pending in the application. Each of the claims have been finally rejected under 35 U.S.C. §103(a). Claims 4, 12, and 19 have been cancelled.

IV. Status of Amendments

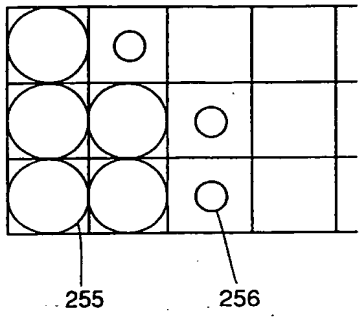
No amendments have been filed subsequent to the final rejection.

V. Summary of the Invention

The following summary of the invention is provided to comply with the requirements of 37 C.F.R. 1.192. The summary is not intended to be, and should not be construed, as a limitation on any of the pending claims.

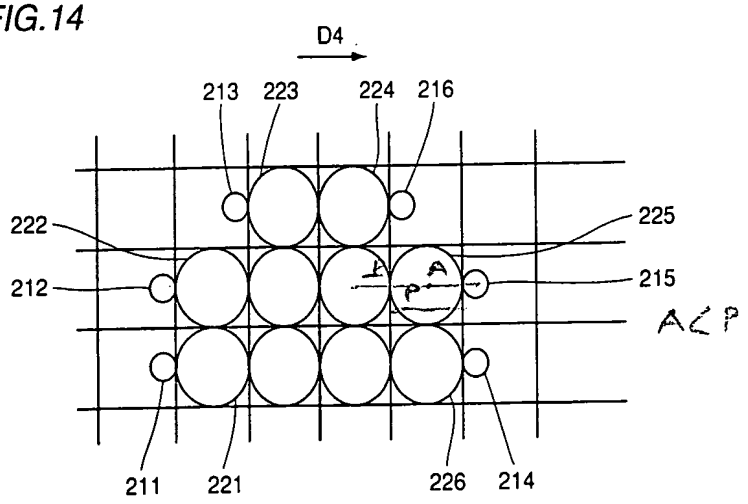
The present invention relates to an ink jet printer having a smoothing function. Smoothing of images is generally accomplished by placing a smoothing dot, which is smaller in size than the image forming dot, adjacent the edge of the image. See, e.g., Figure 30 of the present application, reproduced herein, illustrating smoothing dots 256 adjacent image forming dots 255. In the prior art devices wherein one nozzle is utilized to form both the image forming dots and the smoothing dots, the dots are typically placed in the center of their respective segments, as illustrated in Figure 30. See page 2, lines 16-24 of the present application.

FIG.30 PRIOR ART



It is an object of the present invention to use a single nozzle to form both smoothing dots and image forming dots, wherein the smoothing dots are located such that a distance between a center of the smoothing dot and a center of an adjacent image forming dot is shorter than a distance between the centers of adjacent image forming dots. See Figure 14 of the present application, reproduced herein. In a preferred embodiment, the adjustment of the location of the smoothing dots is accomplished by using a smoothing portion 116 to control the timing of the ejection of the dots. See the paragraph bridging pages 14 and 15 of the present application.

FIG.14



The smoothing dots 214, 215, 216 are placed by setting the timing of the application of the voltage to the piezoelectric element earlier than normal. The smoothing dots 211, 212, and 213 are located by delaying the timing of the application of voltage to the piezoelectric element. See page 17, line 22 through page 18, line 17.

In a second embodiment, the printing position of the dots is controlled by the speed of ejection of the ink droplets. See page 23, line 23 through page 24, line 14 and Figures 18, 19, and 22.

Accordingly, the present invention is able to utilize a single nozzle to control the spacing between smoothing dots and image forming dots.

VI. The Issues

Whether claims 1-3, 5-11, 13-18, and 20-33 are unpatentable under 35 U.S.C. §103(a) in view of U.S. Patent No. 5,689,291, hereinafter *Tence*, in view of U.S. Patent No. 5,745,131, hereinafter *Kneezel*.

VII. Grouping of Claims

Appellants request that the claims be considered in groups, as set forth herein below:

Group I: 1, 2, 3

Group II: 5, 6, 7, 13, 14, 15, 20, 21, 22, 27, 28, 29, 33

Group III: 8, 16, and 23

Group IV: 9, 10, 11

Group V: 17 and 18

Group VI: 24, 25, 26

Group VII: 30

Group VIII: 31, 32

Appellant requests that the claims in each of the foregoing groups stand or fall together, and that each of the groups be considered separately. The reasons as to why each

of the groups are separately patentable are set forth in the following sections relating to the argument.

VIII. Prior Art:

A. U.S. Patent No. 5,689,291, hereinafter *Tence*.

Tence discloses a method and apparatus for producing dot size modulated ink jet printing. As evidenced in Figures 2B and 2C, *Tence* discloses an ink jet printer that is capable of ejecting ink droplets of different sizes from a single nozzle. *Tence* also discloses at column 13, lines 29-35, that changing the scanning speed of the ink jet head relative to the medium can control the dot to dot spacing.

Tence appears to disclose two different modes. In the first mode, referred to as gray scale printing, *Tence* discloses that the size of the ink droplet can be varied, depending upon the gray scale of that portion of the image. Col. 3, lines 56-60. However, in this mode, there is no teaching or suggestion that the spacing between the dots is dependent upon the size of the dot being formed. In other words, it is assumed that each of the dots is evenly spaced from each other, regardless of the size of the dots. A second mode of *Tence* is distinguished from the gray scale printing. The second mode is disclosed as selectable resolution printing, wherein in a first resolution, a first scanning speed and a first ink drop size is selected, and in a second resolution, a second scanning speed and a second ink drop size is selected. For example, in the first resolution, or standard resolution, images are printed at a first scanning speed with 105 nanogram drops, whereas in a second or high resolution at a second scanning speed with 65 nanogram drops. Col. 13, lines 29-45. Thus, the dot to dot spacing in the first resolution is different than the dot to dot spacing in the second resolution. See also claims 1 and 14, wherein the resolution is associated with a fixed scanning speed and volume.

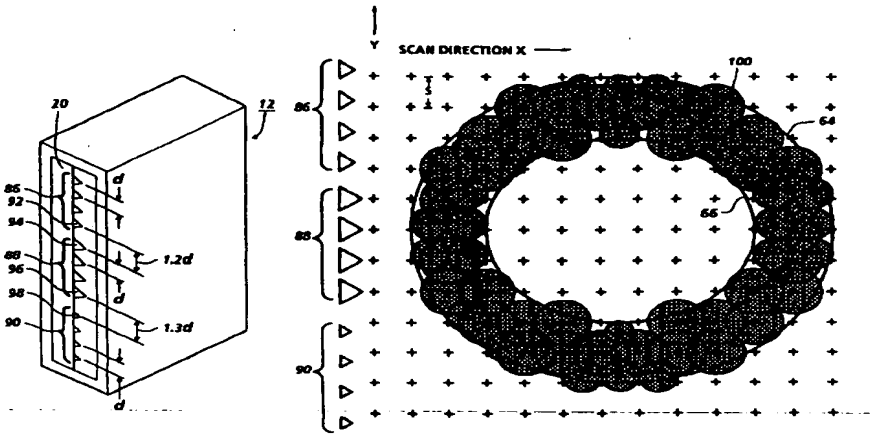
However, in the second mode of *Tence*, there is no teaching or suggestion that the spacing between drops of equal size are varied. In addition, there is no teaching or suggestion that the first resolution is mixed with the second resolution. In other words, in

forming an image, either the first resolution or the second resolution is used, not a combination of both resolutions.

As recognized by the Examiner, *Tence* does not disclose a smoothing operation, using a dot smaller than an image forming dot, and also does not disclose that the distance between the center of at least one of the smoothing dots is smaller than the distance between a center of one of the image forming dots. See paragraph 3 on page 2 of the Official Action dated August 6, 2002.

B. U.S. Patent No. 5,745,131, hereinafter *Kneezel*

Kneezel discloses a gray scale ink jet printer that uses a plurality of nozzles, wherein nozzles in a first set 86 are of one size, and nozzles of a second set 88 are of a second size. See Figures 7 and 8, reproduced herein. The print head 20 (Figure 7) has different offsets or spacings between the sets of nozzles. See column 7, lines 42-45. For instance, an end nozzle 92 of the first plurality of nozzles 86 is spaced at a distance of 1.2d from an end nozzle 94 of the second plurality of nozzles 88. Whereas, an end nozzle 96 of the second plurality of nozzles 88 is spaced from an end nozzle 98 of the third plurality of nozzles 90 a distance of 1.3d. See column 7, lines 45-50. As illustrated in Figure 8, in view of the arrangement of the plurality of nozzles, smoothing dots can be located adjacent larger, image forming dots. However, each individual nozzle in *Kneezel* is only capable of printing a droplet of a fixed size. See column 7, line 35 through line 41. *Kneezel* does not teach or suggest generating a smoothing dot from the same nozzle that generates an image forming dot.



Furthermore, because of the arrangement of the various nozzles in *Kneezel*, *Kneezel* cannot place a smoothing dot adjacent an image forming dot in a single scan. In order to place a smoothing dot near an image forming dot, *Kneezel* must make more than one scan.

IX: Examiner's Rejection:

The Examiner has combined *Tence* with *Kneezel* in order to reject all of the pending claims 1-3, 5-11, 13-18, and 20-33. The Examiner alleges that *Tence* discloses an ink jet printer ejecting a plurality of kinds of ink droplets of different sizes from a single nozzle depending upon data to be printed. The *Tence* printer includes a nozzle for ejecting ink droplets of different sizes. The Examiner further relies upon the fact that *Tence* allegedly discloses that changing the scanning speed of the ink jet head relative to the medium can control the dot to dot spacing. However, the Examiner recognizes that *Tence* does not disclose a smoother for performing a smoothing process using a dot smaller than an image forming dot, and that Tence does not teach that the distance between the center of at least one of the smoothing dots and an adjacent imaging forming dot is smaller than the distance between the center of two adjacent image forming dots. See paragraph 3 on page 2 of the Official Action dated August 6, 2002.

To overcome this deficiency, the Examiner relies upon *Kneezel*. The Examiner alleges that *Kneezel* discloses an ink jet printer which prints image forming dots and smoother dots, wherein a center of at least one of the smoothing dots is smaller than the distance between a center of one of the image forming dots. The Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time of the invention to provide smoother dots closer together than image forming dots, as taught by *Kneezel*, in the ink jet printer of *Tence*, in order to provide a better fill or a smoother fitting.

X: Appellants' Arguments:

1. Claims 1, 2, and 3:

Claim 1 defines an ink jet printer ejecting a plurality of kinds of ink droplets of different sizes from a single nozzle to form an image on a recording medium using dots of sizes corresponding to the sizes of the ink droplets. The ink jet printer of claim 1 includes a smoother for performing a smoothing process using a dot smaller than a dot forming said image and a controller for controlling said smoother to print a center of said smaller size dot close to a center of said image forming dots at a distance smaller than the pitch of the image forming dots. In other words, the distance between a center of the smaller, smoother dot and the center of an adjacent image forming dot is smaller than the distance between the centers of two adjacent image forming dots.

The Examiner relies upon *Tence* for its disclosure of an ink jet printer capable of ejecting a plurality of kinds of ink droplets of different sizes from a single nozzle. The Examiner further notes that changing the scanning speed of the ink jet head relative to the medium can control the dot to dot spacing. As recognized by the Examiner, *Tence* does not teach or suggest a smoothing function, wherein a dot of one size is placed adjacent a larger dot in order to smooth the resulting image. Thus, *Tence* does not teach or suggest a controller for controlling a smoother to print a center of a smaller size dot close to a center of an image forming dot at a distance smaller than the pitch of the image forming dots.

To overcome this deficiency, the Examiner relies upon *Kneezel*. In particular, the Examiner alleges that *Kneezel* discloses an ink jet printer which prints image forming and

smoother dots, wherein a center of at least one of the smoothing dots is smaller than the distance between a center of the image forming dots. The Examiner then concludes that it would have been obvious to one of ordinary skill in the art at the time of the invention to provide smoother dots closer together than image forming dots in the printer of *Tence*.

However, it is important to note that the Examiner's conclusion fails to indicate how the teachings of *Kneezel* could be applied to *Tence*. The Examiner fails to indicate how the teachings of *Tence* would be modified by the teachings of *Kneezel*.

Kneezel teaches the formation of image forming dots and smoother dots by using a *plurality* of nozzles, and by setting the spacing between the nozzles at different distances. Accordingly, if *Tence* were to be modified in order to eject the dots of different sizes with different spacings, as required by claim 1, the only way taught in either of the references is to use a plurality of nozzles with different spacings, as taught by *Kneezel*. There is no teaching or suggestion in either of the references as how a single nozzle could be used to emit the dots of different sizes with the spacings defined in claim 1. Thus, the combination proposed by the Examiner does not show how to achieve the ink jet printer of claim 1 using a single nozzle. There is no suggestion in *Tence* of changing the spacing between dots, other than changing the resolution of the image printing mode. And, there is no indication that the image resolution mode can be changed within a single scan as would be necessary with a single nozzle in order to form smoothing dots.

Furthermore, as set forth above, the Examiner does not indicate how the teachings of *Kneezel* are to be used to modify the teachings of *Tence* in order to result in the claimed invention. However, Appellants assume that a significant change in structure of *Tence* would be required in order to render the structure disclosed therein capable of meeting the elements of claim 1. The only way taught by *Kneezel* would be to use a plurality of nozzles, which is of course, inconsistent with the requirements of claim 1 and the objects of the present invention.

If a proposed modification or combination of the prior art would change the principle of operation of the prior art being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123

USPQ 349 (CCPA 1959) and Section 2143.01 of the Manual of Patent Examining Procedure. Appellants submit that the principle operation of *Tence* would have to be significantly changed in order to meet the language of the pending claims, particularly if modified by the teachings of *Kneezel*. Accordingly, the combination and modification proposed by the Examiner is not appropriate and should be withdrawn.

In summary, (a) the rejection provides no explanation as to how the teachingsof *Tence* are allegedly supposed to be modified, (b) the only way that the cited prior art teaches forming smoother dots with the spacing set forth in claim 1 is to use multiple nozzles, and (3) the principle operation of *Tence* would have to be significantly changed in order to meet the language of the pending claims, particularly if modified by the teachings of *Kneezel*. Claims 2 and 3 depend from claim 1, and are thus patentable at least for the reasons set forth above concerning claim 1.

2. Claims 5, 6, 7, 13, 14, 15, 20, 21, 22, 27, 28, 29, and 33:

Each of the claims in this group relates to changing or controlling the printing position of the smaller, smoother dots by changing the speed of ejection of an ink droplet. As set forth above, *Tence* does not teach or suggest the changing or controlling of the spacing of the smoother or smaller dots in any way other than to change the resolution and scanning speed of the print head. And, *Kneezel* controls the printing position of the smaller or smoother dots by the use of a plurality of nozzles.

Accordingly, neither of the prior art references, either singly or in combination, teaches or suggests the subject matter of the claims of this group. The Examiner has not specifically addressed the patentability of the dependent claims of this group.

3. Claims 8, 16, and 23:

The claims of this group define determination means for determining a direction of the printing position of the smaller dot and indicates that the controller controls the printing position of the smaller dot according to the determination. This determination is signiifcant in that it determines whether the printing of the smoother dot shall be advanced or delayed.

Neither *Tence* nor *Kneezel* appears to teach or suggest such a determining means, and in particular, an arrangement wherein such a determination means is used by a controller to control the printing position of the smaller dots. Accordingly, claims 8, 16, and 23 are also patentable over the cited prior art.

4. Claims 9, 10, and 11:

Claim 9 defines an ink jet printer that includes an ink jet head ejecting a plurality of kinds of ink droplets of different sizes from a single nozzle based on data to be printed, thereby printing on a prescribed recording medium dots of sizes corresponding to the sizes of the ink droplets. The ink jet printer of claim 9 further includes a controller for changing a distance between the centers of adjacent dots thereby to change the printing position of the dot based on the size of the dot in printing said plurality of kinds of dots. In the first embodiment of *Tence*, a single nozzle is used to print dots of different sizes. However, there is no teaching or suggestion in *Tence* of changing a distance between the centers of adjacent dots in that embodiment. Accordingly, the first embodiment of *Tence* does not teach or suggest the subject matter of claim 9 by itself.

Furthermore, as set forth above, if *Tence* were to be modified by the teachings of *Kneezel* in order to control or change a distance between centers of adjacent dots, the only teaching for making such a change would be to use a plurality of nozzles. Accordingly, *Kneezel* does not teach or suggest a modification to *Tence* in order to arrive at the subject matter of claim 9. Any modification suggested by *Kneezel* would result in use of more than a single nozzle.

With regard to the second embodiment of *Tence*, an ink jet nozzle can be operated at different resolutions. In a first resolution, the spacing between the dots is set to a first spacing and in a second resolution, a different spacing between the dots is set. However, in this embodiment of *Tence,* the size of the dots is set based on the selected resolution, thus there is only one size dot per image. Accordingly, *Tence* does not teach or suggest a controller that changes a distance between the centers of adjacent dots to change the printing position of the dot based on the size of the dot in printing said plurality of kinds of

dots. Accordingly, although *Tence* teaches that the printing position of the dot is based on the size of the dot when printing only one size of dot, *Tence* clearly does not teach or suggest changing a distance between centers of adjacent dots based on the size of the dot when printing a plurality of kinds of dots, as required by claim 9. Furthermore, as set forth above, any modification to *Tence* based on the teachings of *Kneezel* would require the use of a plurality of nozzles. Accordingly, neither *Tence* by itself, nor in combination with *Kneezel*, teaches or suggests the subject matter of claim 9.

5. Claims 17 and 18:

Claim 17 defines a method of controlling printing in an ink jet printer which ejects a plurality of kinds of ink droplets of different sizes from a *single nozzle* based on data to be printed. The method includes determining whether or not control of the printing position of a dot is necessary and controlling the timing of printing the dot if it is determined to be necessary. In the first embodiment of *Tence*, the size of the dot may be changed based on data to be printed. However, in this embodiment, there is no teaching or suggestion of controlling the timing of printing of the dot. It is assumed that the dots in the first embodiment are equally spaced. In the second embodiment, if a first resolution is selected, dots of a first size are printed at a first spacing, and if a second resolution is selected, dots of a second size are printed at a second spacing. Thus, there is no teaching or suggestion of using droplets of different sizes based on data to be printed. Furthermore, neither embodiment of *Tence* teaches or suggests the step of determining whether or not control of the printing position of a dot is necessary.

As set forth above, any modification of *Tence* based on *Kneezel* would involve using a plurality of nozzles. Thus, the modification of *Tence* to use more than a single nozzle would teach away from the present invention. Accordingly, claim 17 is not taught or suggested by either of the references, either singly, or in combination.

Claim 18 depends from claim 17, and is thus patentable at least for the reasons set forth above for claim 17.

6. Claims 24, 25, 26, and 30:

Claim 24 defines an ink jet printer comprising a nozzle for ejecting ink droplets of different sizes to form an image on a recording medium with image forming dots and smoothing dots, wherein the smoothing dots are smaller than the image forming dots. The ink jet printer of claim 24 further includes a smoother for smoothing the image by arranging the smoothing dots around edges of the image forming dots, wherein a distance between a center of at least one of the smoothing dots and a center of one of the image forming dots adjacent to said one smoothing dot is shorter than a distance between the centers of adjacent image forming dots.

The Examiner relies upon *Tence* for its disclosure of an ink jet printer capable of ejecting a plurality of kinds of ink droplets of different sizes from a single nozzle. The Examiner further notes that changing the scanning speed of the ink jet head relative to the medium can control the dot to dot spacing. As recognized by the Examiner, *Tence* does not teach or suggest a smoothing function, wherein a dot of one size is placed adjacent a larger dot in order to smooth the resulting image. Thus, *Tence* does not teach or suggest a controller for controlling a smoother to print a center of a smaller size dot close to a center of an image forming dot at a distance smaller than the pitch of the image forming dots.

To overcome this deficiency, the Examiner relies upon *Kneezel*. In particular, the Examiner alleges that *Kneezel* discloses an ink jet printer which prints image forming and smoother dots, wherein a center of at least one of the smoothing dots is smaller than the distance between a center of the image forming dots. The Examiner then concludes that it would have been obvious to one of ordinary skill in the art at the time of the invention to provide smoother dots closer together than image forming dots in the printer of *Tence*.

However, it is important to note that the Examiner's conclusion fails to indicate how the teachings of *Kneezel* could be applied to *Tence*. The Examiner fails to indicate how the teachings of *Tence* would be modified by the teachings of *Kneezel*.

Kneezel teaches the formation of image forming dots and smoother dots by using a plurality of nozzles, and by setting the spacing between the nozzles at different distances. Accordingly, if *Tence* were to be modified in order to eject the dots of different sizes with

different spacings, as required by claim 24, the only way taught in either of the references is to use a plurality of nozzles with different spacings, as taught by *Kneezel*. There is no teaching or suggestion in either of the references as how a nozzle could be used to emit the dots of different sizes with the spacings defined in claim 24. Thus, the combination proposed by the Examiner does not show how to achieve the ink jet printer of claim 24 using a nozzle for ejecting ink droplets of different sizes. There is no suggestion in *Tence* of changing the spacing between dots, other than changing the resolution of the image printing mode. And, there is no indication that the image resolution mode can be changed within a single scan as would be necessary with a single nozzle in order to form smoothing dots.

Furthermore, as set forth above, the Examiner does not indicate how the teachings of *Kneezel* are to be used to modify the teachings of *Tence* in order to result in the claimed invention. However, Appellants assume that a significant change in structure of *Tence* would be required in order to render the structure disclosed therein capable of meeting the elements of claim 24. The only way taught by *Kneezel* would be to use a plurality of nozzles, which is of course, inconsistent with the requirements of claim 24 and the objects of the present invention.

If a proposed modification or combination of the prior art would change the principle of operation of the prior art being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) and Section 2143.01 of the Manual of Patent Examining Procedure. Appellants submit that the principle operation of *Tence* would have to be significantly changed in order to meet the language of the pending claims, particularly if modified by the teachings of *Kneezel*. Accordingly, the combination and modification proposed by the Examiner is not appropriate and should be withdrawn.

In summary, (a) the rejection provides no explanation as to how the teachingsof *Tence* are allegedly supposed to be modified, (b) the only way that the cited prior art teaches forming smoother dots with the spacing set forth in claim 24 is to use multiple nozzles, and (3) the principle operation of *Tence* would have to be significantly changed in

order to meet the language of the pending claims, particularly if modified by the teachings of *Kneezel*.

Claims 25 and 26 depend from claim 24, and are thus patentable at least for the reasons set forth above with respect to claim 24. Claim 30 is similar to claim 24, except that claim 30 defines a method of controlling printing, not a printer.

7. Claims 31 and 32:

Claim 31 defines an ink jet printer comprising an ink jet head comprising at least one nozzle which is capable of ejecting ink droplets of different sizes to form, on a recording medium, image forming dots and smoothing dots, wherein the smoothing dots are smaller than any one of the image forming dots. The ink jet head is capable of scanning on the recording medium while ejecting, from the at least one nozzle, the ink droplets to form an image consisting of the image forming dots and the smoothing dots that are located on any one of a plurality of scanning lines. The ink jet printer further includes a smoother for smoothing the image by arranging the smoothing dots around edges of the image forming dots, wherein on each scanning line, a distance between a center of one of the smoothing dots and a center of one of the image forming dots adjacent to said one smoothing dot is shorter than a distance between the centers of adjacent image forming dots.

Claim 31 is similar to claim 24. One exception is that claim 31 is specific that on each scanning line, a distance between a center of one of the smoothing dots and a center of one of the image forming dots adjacent to said one smoothing dot is shorter than a distance between the centers of adjacent image forming dots. Accordingly, claim 31 is patentable over the cited prior art at least for the reasons set forth above with respect to claim 24.

IX. Conclusion

In view of the foregoing arguments, the rejections of the Examiner should be reversed.

Respectfully submitted,

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Date: Feb. 27, 2003

APPENDIX A

The Appealed Claims

1. An ink jet printer ejecting a plurality of kinds of ink droplets of different sizes from a single nozzle depending upon data to be printed, thereby forming an image on a prescribed recording medium using dots of sizes corresponding to the sizes of the ink droplets, comprising:

a smoother for performing a smoothing process using a dot smaller than a dot forming said image; and

a controller for controlling said smoother to print a center of said smaller size dot close to a center of said image forming dots at a distance smaller than the pitch of the image forming dots.

2. The ink jet printer as recited in claim 1, wherein said controller controls the position of printing the smaller dot by controlling the timing of printing the smaller dot.

3. The ink jet printer as recited in claim 2, wherein in said timing control, the timing of applying signal voltage to print said smaller dot is controlled.

5. The ink jet printer as recited in claim 1, wherein said controller controls the printing position of the smaller dot by changing the speed of ejection of an ink droplet forming said smaller dot.

6. The ink jet printer as recited in claim 5, wherein said speed of ejection of said ink droplet is changed by changing a change degree in signal voltage to print said dot.

7. The ink jet printer as recited in claim 1, wherein said ink jet printer comprising an ink jet head ejecting said ink droplet, said ink jet head being moved at a prescribed speed in a prescribed direction, and said controller controls the printing position of said smaller dot based on the ejection speed of the ink droplet and said scanning speed.

8. The ink jet printer as recited in claim 1 further comprising determination means for determining a direction of the printing position of said smaller dot, said controller controlling the printing position of said smaller dot according to the determination.

9. An ink jet printer, comprising:

an ink jet head ejecting a plurality of kinds of ink droplets of different sizes from a single nozzle based on data to be printed, thereby printing, on a prescribed recording medium, dots of sizes corresponding to the sizes of the ink droplets; and

a controller for changing a distance between the centers of adjacent dots thereby to change the printing position of the dot based on the size of the dot in printing said plurality of kinds of dots.

10. The ink jet printer as recited in claim 9, wherein said controller controls said printing position by controlling the timing of printing said dot.

11. The ink jet printer as recited in claim 10, wherein in said timing control, the timing of applying signal voltage to print said dot is controlled.

13. The ink jet printer as recited in claim 9, wherein said controller controls the printing position of said dot by changing the ejection speed of the ink droplet.

14. The ink jet printer as recited in claim 13, wherein the speed of ejection of said ink droplet is changed by changing a change degree in signal voltage to print said dot.

15. The ink jet printer as recited in claim 9, wherein said ink jet head is moved at a prescribed scanning speed in a prescribed direction, and said controller controls the printing position of the dot based on the ejection speed of the ink droplet and said scanning speed.

16. The ink jet printer as recited in claim 9 further comprising determination means for determining a direction of the printing position of said smaller dot, said controller controlling the printing position of said smaller dot according to the determination.

17. A method of controlling printing in an ink jet printer which ejects a plurality of kinds of ink droplets of different sizes from a single nozzle based on data to be printed, thereby printing, on a prescribed recording medium, dots of sizes corresponding to the sizes of the ink droplets, comprising the steps of:

determining whether or not control of the printing position of a dot is necessary; and

controlling the timing of printing the dot if it is determined necessary.

18. The method as recited in claim 17, wherein in said timing control, the timing of applying signal voltage to print said dot is controlled.

20. The method as recited in claim 17, wherein said printing position of said dot is controlled by changing the speed of ejection of said ink droplet.

21. The method as recited in claim 20, wherein the speed of ejection of the ink droplet is changed by changing a change degree in signal voltage to print said dot.

22. The method as recited in claim 17, wherein said ink jet printer includes an ink jet head for ejecting said ink droplets, said ink jet head is moved at a prescribed scanning speed in a prescribed direction, and said controller controls the printing position of the dot based on the speed of ejection of said ink droplets and said scanning speed.

23. The method as recited in claim 17, further comprising a step of determining a direction of controlling said printing position of a dot, if it is determined that the control of said printing position is necessary.

24. An ink jet printer comprising:

a nozzle for ejecting ink droplets of different sizes to form an image on a recording medium with image forming dots and smoothing dots, wherein said smoothing dots are smaller than the image forming dots; and

a smoother for smoothing the image by arranging the smoothing dots around edges of the image forming dots,

wherein a distance between a center of at least one of the smoothing dots and a center of one of the image forming dots adjacent to said one smoothing dot is shorter than a distance between the centers of adjacent image forming dots.

25. The ink jet printer as recited in claim 24, wherein said distance between the center of the smoothing dot and the center of the image forming dot adjacent to said one smoothing dot is controlled by controlling the timing of printing the smoothing dots.

26. The ink jet printer as recited in claim 25, wherein in said timing control, the timing of applying signal voltage to print said smoothing dot is controlled.

27. An ink jet printer as recited in claim 24, wherein said distance between the center of the smoothing dot and the center of the image forming dot adjacent to said smoothing dot is controlled by controlling the speed of ejection of an ink droplet forming said smoothing dot.

28. An ink jet printer as recited in claim 27, wherein said speed of ejection of said ink droplet is controlled by varying a change degree in signal voltage to print said smoothing dot.

29. An ink jet printer as recited in claim 24, wherein said nozzle moves along the recording medium during a printing operation, and said distance between the smoothing dot and the center of the image forming dot adjacent to said smoothing dot is controlled based on the ejection speed of the ink droplet and the moving speed of the nozzle.

30. A method of controlling printing in an ink jet printer having a nozzle for ejecting ink droplets of different sizes to form an image on a recording medium using dots of sizes corresponding to sizes of the ink droplets, said method comprising:

performing a smoothing process to image data to smooth an image to be printed; and

ejecting ink droplets of different sizes from the nozzle based on the image data on which has been performed the smoothing process so that smoothing dots are arranged around edges of the image forming dots,

wherein said smoothing dots are smaller than the image forming dots, and a distance between a center of at least one of the smoothing dots and a center of one of the image forming dots adjacent to said one smoothing dot is shorter than a distance between the centers of adjacent image forming dots.--

31. An ink jet printer comprising:

an ink jet head comprising at least one nozzle which is capable of ejecting ink droplets of different sizes to form, on a recording medium, image forming dots and smoothing dots, wherein the smoothing dots are smaller than any one of the image forming dots, said ink jet head being capable of scanning on the recording medium while ejecting, from the at least one nozzle, the ink droplets to form an image consisting of the image forming dots and the smoothing dots that are located on any one of a plurality of scanning lines; and

a smoother for smoothing the image by arranging the smoothing dots around edges of the image forming dots,

wherein, on each scanning line, a distance between a center of one of the smoothing dots and a center of one of the image forming dots adjacent to said one smoothing dots is shorter than a distance between the centers of adjacent image forming dots.

32. The ink jet printer as recited in claim 31, wherein said distance between the center of the smoothing dot and the center of the image forming dot adjacent to said one smoothing dot is controlled by controlling the timing of printing the smoothing dots.

33. An ink jet printer as recited in claim 31, wherein said nozzle moves along the recording medium during a printing operation, and said distance between the smoothing dot and the center of the image forming dot adjacent to said smoothing dot is controlled based on the ejection speed of the ink droplet and the moving speed of the nozzle.--